

DECLARATION

I, Mi Yeon CHUNG, a Korean citizen of 204-1006 Family Apartment, Moonjung-dong, Songpa-gu, Seoul, Korea do hereby solemnly and sincerely declare as follows:

1. That I am well acquainted with the English and Korean languages.
2. That the following is a correct translation into English of Korean Patent

Application No. 2002-0057013 filed September 18, 2002, and I make the solemn declaration conscientiously believing the same to be true.

Seoul, October 2, 2006



Mi Yeon CHUNG

[DOCUMENT] Application for Patent

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5 [TITLE OF THE INVENTION-KOREAN] 프린터용 레이저 스캔유닛
조정장치

[TITLE OF THE INVENTION-ENGLISH] Adjusting apparatus for laser scan unit
of printer

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[EXAMINATION REQUEST] REQUESTED

25 [PURPOSE] I, hereby, submit the present application for the Patent and request the

examination of the present invention under the Article 42 and the Article 60 of the Patent Law.

Attorney

Hong-sik JEONG (seal)

[Official Fee]

5	[Basic fee]	20	pages	₩	29,000
	[Additional fee]	1	pages	₩	1,000
	[Claiming Priority Right]	0	case	₩	0
	[Filing Request For Examination]	19	claims	₩	717,000
	[Total]			₩	747,000

10 [Documents] 1. One copy of Abstract, Specification (& drawings)

[ABSTRACT OF THE DISCLOSURE]

[Abstract]

The present invention relates to a laser printer using a plurality of laser scan units and more particularly, an apparatus for adjusting laser scan units for a printer capable of adjusting laser beams in parallel with each other. In order to accomplish the above object, the present invention provides an apparatus for adjusting a laser scan unit for a print comprises a scan unit for scanning with a laser beam, a control plate provided at one end with a hinge axis and at the other end with an inclined plane and a guiding hole for fixing the laser scan unit, a control screw, a fixed plate disposed under the control plate and provided at one end with a supporting groove for supporting hinge axis of the control plate, and a control tab disposed at the other end of the fixed plate for guiding a linear reciprocating motion of the control screw to the inclined plane, in which by turning of the control screw, the control plate turns around the hinge axis by the inclined plane. Preferably, the apparatus for adjusting a laser scan unit may further comprise an resilient plate which is assembled over the supporting groove and functions to press the hinge axis so that the hinge axis maintains contact with the supporting groove at all times. Here, preferably, the laser scan unit is disposed so that an optical axis of a laser beam is placed on the same plane with a center line of the hinge axis of the control plate. Preferably, the control screw is provided at its tip with a moving ring and the fixed plate is provided with a guiding groove for guiding a linear reciprocating motion of the moving ring.

[The main figure]

Fig. 1

[Search terms]

25 laser printer, laser scan unit, laser beam, parallel, control screw

[SPECIFICATION]

[The title of the invention]

Adjusting apparatus for laser scan unit of printer

[The brief description of the drawings]

5 Fig. 1 is a perspective view of the apparatus for adjusting a laser scan unit for a printer according to the present invention;

Fig. 2 is a broken perspective view of the apparatus for adjusting a laser scan unit for a printer shown in Fig. 1;

10 Fig. 3 is a partial perspective view showing in detail the guiding groove shown in Fig. 2;

Fig. 4 is a perspective view with a partial cross section cut off for illustrating the relation between the control screw and the inclined plane in the apparatus for adjusting a laser scan unit for a printer shown in Fig. 1; and

15 Fig. 5 is a perspective view of a laser scanning apparatus for a printer comprising four apparatuses for adjusting a laser scan unit assembled.

Description of the reference numerals in the drawings

1: laser beam	10: laser scan unit
20: control plate	22: hinge axis
24: inclined plane	26: guiding holes
20 30: fixed plate	32: control tab
34: supporting groove	36: guiding groove
38: resilient plate	40: control screw
42: moving ring	50: guiding pins
52: compression springs	60: printer
25 70: frame	

[Detailed description of the invention]

[Object of the invention]

[The field of the invention and the prior art]

The present invention relates to a laser printer using a plurality of laser scan units and more particularly, to an apparatus for adjusting laser scan units for a printer capable of adjusting laser beams scanned from the plurality of laser scan units in parallel with each other.

In general, a laser printer prints information by forming an electrostatic latent image on a photosensitive body using a laser beam emitted from a laser scan unit and transferring the latent image to paper. Some kinds of laser printers such as a laser color printer form latent images on a photosensitive body using a plurality of laser scan units. Here, the plurality of laser scan units are aligned in parallel with each other at regular intervals, whereby laser beams emitted from the laser scan units form latent images at regular intervals on the photosensitive body. Thereafter, the latent images created on the photosensitive body are developed and transferred to paper to produce a print.

However, sometimes in such laser printers using a plurality of laser scan units, the laser beams emitted from respective laser scan units cannot be in parallel with each other due to machining allowances between parts constituting the laser scan units and assembling error created when each of the laser scan units is assembled. If the laser beams are not scanned in parallel, positions of respective colors cross each other, thereby causing degradation of printed image quality

In order to solve such problems, there has been devised an apparatus for adjusting a plurality of laser beams emitted to a photosensitive body by adjusting an angle of a reflection mirror constituting a laser scan unit in the prior art. Here, since

the reflection mirror is inside the laser scan unit, a motor for adjusting an angle of the reflection mirror is generally installed in the laser scan unit. The motor is automatically controlled by a motor control part.

However, such method adjusting a reflection mirror using a motor has
5 problems as follows:

Firstly, since a motor is installed inside a laser scan unit, a temperature inside the laser scan unit can be increased due to increase in temperature of the motor upon use for a long period of time, whereby the life span of the laser scan unit is reduced.

Secondly, a motor and motor control part are additionally needed, causing
10 increase in production cost.

Thirdly, an additional room for installation of a motor control part is needed, causing increase in product size.

[Technical object of the invention]

Therefore, in order to solve the problems involved in the prior arts, it is an
15 object of the present invention to provide an apparatus for adjusting a laser scan unit for a printer which can adjust laser beams emitted from a plurality of laser scan units in parallel with each other by turning of a screw, whereby it has a long life span and can be produced at a low cost, but not big in size.

[Construction and operation of the invention]

20 In order to accomplish the above object of the present invention, according to the present invention, there is provided an apparatus for adjusting a laser scan unit for a print comprises a scan unit for scanning with a laser beam, a control plate provided at one end with a hinge axis and at the other end with an inclined plane and a guiding hole for fixing the laser scan unit, a control screw, a fixed plate disposed under the
25 control plate and provided at one end with a supporting groove for supporting hinge

axis of the control plate, and a control tab disposed at the other end of the fixed plate for guiding a linear reciprocating motion of the control screw to the inclined plane, in which by turning of the control screw, the control plate turns around the hinge axis by the inclined plane.

5 Preferably, the apparatus for adjusting a laser scan unit may further comprise an resilient plate which is assembled over the supporting groove and functions to press the hinge axis so that the hinge axis maintains contact with the supporting groove at all times.

Here, preferably, the laser scan unit is disposed so that an optical axis of a
10 laser beam is placed on the same plane as a center line of the hinge axis of the control plate.

Preferably, the control screw is provided at its tip with a moving ring and the fixed plate is provided with a guiding groove for guiding a linear reciprocating motion of the moving ring.

15 In another embodiment according to the present invention, there is provided an apparatus for adjusting a laser scan unit for a print comprises a control plate provided at one end with a hinge axis and at the other end with an inclined plane and a guiding hole for fixing the laser scan unit, a laser scan unit for scanning with a laser beam, which is assembled at the control plate so that the optical axis of the laser beam is in
20 the same plane as the center line of the hinge axis and the main scanning direction of the laser beam is in perpendicular relation with respect to the center line of the hinge axis, a control screw, a fixed plate disposed under the control plate and provided at one end with a supporting groove for supporting hinge axis of the control plate, a control tab disposed at the other end of the fixed plate for guiding a linear reciprocating motion of the control screw to the inclined plane, and a guiding pin fixed at the fixed

plate through the guiding hole, in which by turning of the control screw, the control plate turns around the hinge axis by the inclined plane and the turning of the control plate is guided by the guiding pin.

Here, preferably, two guiding pins are disposed at the right and left of the 5 incline plane, one for each side. Also, the guiding pins over the control plate are provided with compression springs and the compression springs function to apply pressure to the control plate at all times.

In another aspect, a laser scanning apparatus including a plurality of the 10 apparatuses for adjusting a laser scan unit for a printer according to the present invention comprises a frame and a plurality of the apparatuses for adjusting a laser scan unit for a printer, in which the control plate may turn around the hinge axis by the inclined plane by turning of the control screw, thereby adjusting the plurality of the laser scan units in parallel. Here, preferably, four apparatuses for adjusting a scan unit are assembled.

15 Now, a preferred embodiment of the present invention will be described in detail with reference to the accompanying drawings.

Referring to Fig. 1 to Fig. 4, the apparatus for adjusting a laser scan unit for a printer 60 includes a laser scan unit 10, a control plate 20, a fixed plate 30, a control screw 40 and guiding pins 50.

20 The laser scan unit 10 scans with a laser beam 1, and includes a laser emitting source 1 for emitting the laser beam, a collimator, a cylinder lens, a polymirror, an f-theta lens and a reflection mirror in a casing. In Fig. 1, the laser beam 1 emitted from the laser scan unit 10 is shown.

The laser scan unit 10 is fixed on the control plate 20. The control plate 20 is 25 provided at an end thereof with a hinge axis 22 capable of turning the control plate 20

and at the other end with an inclined plane 24. The inclined plane 24 may be provided at its right and left side with guiding holes 26 through which the guiding pins 50 passes to guide the control plate 20 which minutely turns upward and downward around the hinge axis 22. Also, the control plate is preferably formed so that the 5 center line 23 of the hinge axis 22 of the control plate 20 is located on a scanned plane with the laser beam 1 emitted from the laser scan unit 10. Therefore, as shown in Fig. 2, the control plate is preferably formed with a through hole 28 by cutting a part interfered with the laser scan unit 10. The laser scan unit 10 is disposed on the control plate 20 in a manner such that the emitting direction of the laser beam is in 10 parallel with the hinge axis 23. That is, the main scanning direction of the laser beam 1 (arrow shown in Fig. 3) is in perpendicular relation with respect to the hinge axis 23.

The fixed plate 30 is disposed under the control plate 20 and is provided at one end with a supporting groove 34 to support the hinge axis 22 of the control plate 20. Preferably, the supporting groove 34 is formed into a V-shape, as shown in Fig. 4. 15 Also, the fixed plate 30 is provided at the other end with a control tab 32 with which the control screw 40 is assembled at a position corresponding to the underside of the inclined plane 24 of the control plate 20. Therefore, when the control screw 40 is assembled into the control tab 32, its tip contacts with the inclined plane 24 of the control plate 20. When the control screw is turned clockwise or counterclockwise, 20 the control screw can move forward and backward in a linear reciprocating motion against the control tab 32. Thus, the inclined plane 24 being in contact with the tip of the control screw 40 is moved upward and downward. Here, a moving ring 42 may be preferably inserted in the tip of the control screw 40 to prevent the abrasion of the inclined plane 24 by the rotation of the control screw. Further, it is preferable that the 25 fixed plate 30 further comprises a guiding groove 36 in the front of the control tab 32

for smooth locomotion of the moving ring 42 (refer to Fig. 3).

Also, a resilient plate 38 is assembled over the supporting groove 34 of the fixed plate 30 to push down the hinge axis 22 of the control plate 20, which is inserted to the supporting groove 34. The resilience of the resilient plate 38 is determined in 5 such a range that allows the control plate 20 to freely move upward and downward by the control screw 40 while keeping the hinge axis 22 in contact with the supporting groove 34.

The control screw 40 is assembled at the control tab 32 of the fixed plate 30. When the control screw 40 is turned, it can go forward while rotating.

10 Here, it is necessary to set a slope of the laser beam 1, that is, a slope of the control plate 20, per one revolution of the control screw 40. The magnitude of the upward and downward movement of the control plate 20 caused by revolution of the control screw 40 is determined in accordance with a pitch of the control screw 40 and a slope of the inclined plane 24 of the control plate 20. In this embodiment, the control 15 plate 20 is set to move 20 μm when the control screw 40 turns 30°.

The guiding pins 50 pass through the guiding holes 26 on the control plate 20 to be fixed at the fixed plate 30. Preferably, two guiding pins 50 are disposed at the right and left of the inclined plane 24, though it is possible to provide only one guiding pin 50 to guide the upward and downward movement of the control plate 20. Also, 20 the guiding pins 50 are provided with compression springs 52. By the resilience of the compression springs 52, the control plate 20 is pushed downward at all times. Therefore, the inclined plane 24 of the control plate 20 is kept in contact with the moving ring 42 of the control screw 40.

Now, the operation of the apparatus for adjusting a laser scan unit for a print 25 having the above described construction will be explained in detail with reference to

the accompanying drawings.

When the control screw 40 is turned, the control screw 40 goes forward while rotating. Here, if the control screw 40 is a right hand thread, when the control screw 40 is turned clockwise, it goes straight toward the inclined plane 24. As the control screw 40 goes forward, the control plate 20 is lifted upward by turning around the hinge axis 22 by the inclined plane 24. Also, when the control screw 40 is turned counterclockwise, it moves back from the inclined plane 24. As the control screw 40 moves back, the control plate 20 descends downward by its weight. Thus, it is possible to adjust the slope of the control plate 20 against the hinge axis 22 by turning the control screw 40 clockwise or counterclockwise. Here, since the control plate 20 is pushed down by the compression springs 52, the moving ring 42 can be kept in contact with the inclined plane 24. Accordingly, when the control screw 40 moves back, the control plate 20 moves downward at the same time. As the slope of the control plate 20 against the fixed plate 30 is adjusted, the slope of the laser scan unit 10 disposed on the control plate 20 is adjusted so that the laser beam 1 is scanned on the same plane with the center line 23 of the hinge axis, whereby the slope of the laser beam 1 against the fixed plate 30 is adjusted.

In Fig. 5, a laser scanning apparatus for a printer comprising a plurality of apparatuses for adjusting a laser scan unit assembled.

Referring to Fig. 5, four apparatuses for adjusting a laser scan unit for a printer 60 are assembled on a frame 70, in parallel with each other. Here, the spaces between the apparatuses for adjusting a laser scan unit 60 assembled on the frame 70 are not uniform due to process tolerance difference and assembly tolerance difference between the frame 70 and components of the apparatuses for adjusting a laser scan unit 60. Therefore, the laser beams emitted from the laser scan unit 10 are not in parallel with

each other.

Here, the spaces between the apparatuses for adjusting a laser scan unit 60 can be adjusted to correspond to designed dimensions, for example, by using a shim. Then, the laser beams 1 are adjusted in parallel with each other by turning the control screw 40 of the apparatus for adjusting a laser scan unit 60.

As described above, by the apparatus for adjusting a laser scan unit for a print according to the present invention, it is possible to simply adjust laser beams emitted from a plurality of laser scan units in parallel with each other by turning of a screw. In particular, since the apparatus for adjusting a laser scan unit does not use a motor, a 10 temperature inside the laser scan unit is not increased and the production cost is reduced.

[Effect of the invention]

Therefore, by using the above-described apparatus for adjusting a laser scan unit according to the present invention, it is possible to easily adjust a plurality of laser 15 beams in parallel with each other by means of a simple action of turning the control screw, and thus to provide an apparatus for adjusting a laser scan unit for a printer which has a long life span and can be produced at a low cost, but does not big in size.

The present invention is not limited to the above described embodiments, those possessing ordinary knowledge in the field to which the present invention 20 belongs may construct various modifications and changes, without departing from the scope and spirit of the invention as disclosed in the accompanying claims and such modifications and changes fall in the scope of the present invention defined in the claims.

[What is claimed is]

[Claim 1]

An apparatus for adjusting a laser scan unit for a printer comprising:
a scan unit for scanning with a laser beam;
5 a control plate provided at one end thereof with a hinge axis and at the other end with an inclined plane, on which the scan unit is fixed;
a control screw;
a fixed plate disposed under the control plate and provided at one end with a supporting groove for supporting the hinge axis of the control plate; and
10 a control tab disposed at the other end of the fixed plate for guiding a linear reciprocating motion of the control screw to the inclined plane,
in which by turning of the control screw, the control plate turns around the hinge axis by the inclined plane.

[Claim 2]

15 The apparatus according to claim 1, which further comprises an resilient plate which is assembled over the supporting groove and functions to press the hinge axis so that the hinge axis maintains contact with the supporting groove at all times.

[Claim 3]

20 The apparatus according to claim 1, wherein the laser scan unit is disposed so that an optical axis of a laser beam is placed on the same plane with a center line of the hinge axis of the control plate.

[Claim 4]

The apparatus according to claim 1, wherein the control screw is provided at its tip with a moving ring.

25 **[Claim 5]**

The apparatus according to claim 4, wherein the fixed plate further comprises a guiding groove for guiding a linear reciprocating motion of the moving ring.

[Claim 6]

An apparatus for adjusting a laser scan unit for a printer comprising:
5 a control plate provided at one end with a hinge axis and at the other end with an inclined plane and a guiding hole;
a laser scan unit for scanning with a laser beam, which is assembled on the control plate so that the main scanning direction of the laser beam is in perpendicular relation with respect to the hinge axis;
10 a control screw;
a fixed plate disposed under the control plate and provided at one end with a supporting groove for supporting the hinge axis of the control plate;
a control tab disposed at the other end of the fixed plate for guiding a linear reciprocating motion of the control screw to the inclined plane; and
15 a guiding pin fixed at the fixed plate through the guiding hole,
in which by turning of the control screw, the control plate turns around the hinge axis by the inclined plane and the turning of the control plate is guided by the guiding pin.

[Claim 7]

20 The apparatus according to claim 6, which further comprises an resilient plate which is assembled over the supporting groove and functions to press the hinge axis so that the hinge axis maintains contact with the supporting groove at all times.

[Claim 8]

25 The apparatus according to claim 6, wherein the laser scan unit is disposed so that an optical axis of a laser beam is placed on the same plane with a center line of the

hinge axis of the control plate.

[Claim 9]

The apparatus according to claim 6, wherein the control screw is provided at its tip with a moving ring.

5 **[Claim 10]**

The apparatus according to claim 9, wherein the fixed plate further comprises a guiding groove for guiding a linear reciprocating motion of the moving ring.

[Claim 11]

10 The apparatus according to claim 6, wherein the guiding pins are disposed at the right and left of the incline plane, one for each side.

[Claim 12]

The apparatus according to claim 6 or claim 11, wherein the guiding pins over the control plate are provided with compression springs and the compression springs function to apply pressure to the control plate at all times.

15 **[Claim 13]**

A laser scanning apparatus for a printer comprising:

a frame, and

a plurality of apparatuses for adjusting a laser scan unit for a printer comprising:

20 a control plate provided at one end with a hinge axis and at the other end with an inclined plane and a guiding hole;

 a laser scan unit for scanning with a laser beam, which is assembled on the control plate so that the optical axis of the laser beam is in the same plane as the centerline of the hinge axis, and the main scanning direction of the laser beam is in 25 perpendicular relation with respect to the center line of the hinge axis;

a control screw;

a fixed plate disposed under the control plate and provided at one end with a supporting groove for supporting hinge axis of the control plate;

a control tab disposed at the other end of the fixed plate for guiding a linear reciprocating motion of the control screw to the inclined plane; and

5 a guiding pin fixed at the fixed plate through the guiding hole, in which by turning of the control screw, the control plate turns around the hinge axis by the inclined plane, thereby adjusting the plurality of the laser scan units in parallel with each other.

10 **[Claim 14]**

The apparatus according to claim 13, which further comprises an resilient plate which is assembled over the supporting groove and functions to press the hinge axis so that the hinge axis maintains contact with the supporting groove at all times.

[Claim 15]

15 The apparatus according to claim 13, wherein the guiding pins are disposed at the right and left of the incline plane, one for each side.

[Claim 16]

The apparatus according to claim 13, wherein the guiding pins over the control plate are provided with compression springs and the compression springs function to 20 apply pressure to the control plate at all times.

[Claim 17]

The apparatus according to claim 13, which comprises four apparatuses for adjusting a laser scan unit.

[Claim 18]

25 A laser printer comprising a laser scanning apparatus comprising:

a frame, and
a plurality of apparatuses for adjusting a laser scan unit for a printer comprising:

- 5 a control plate provided at one end with a hinge axis and at the other end with an inclined plane and a guiding hole;
- 10 a laser scan unit for scanning with a laser beam, which is assembled on the control plate so that the optical axis of the laser beam is in the same plane as the center line of the hinge axis, and the main scanning direction of the laser beam is in perpendicular relation with respect to the center line of the hinge axis;
- 15 a control screw;
- a fixed plate disposed under the control plate and provided at one end with a supporting groove for supporting hinge axis of the control plate;
- a control tab disposed at the other end of the fixed plate for guiding a linear reciprocating motion of the control screw to the inclined plane; and
- 20 a guiding pin fixed at the fixed plate through the guiding hole, in which by turning of the control screw, the control plate turns around the hinge axis by the inclined plane, thereby adjusting the plurality of the laser scan units in parallel with each other.

[Claim 19]

- 20 The laser printer according to claim 18, wherein four apparatuses for adjusting a laser scan unit are assembled on the frame.